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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/667,966	09/22/2000	ZEWU CHEN	0444.035	1170

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EXAMINER

BARBER, THERESE

ART UNIT

PAPER NUMBER

2882

DATE MAILED: 05/01/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/667,966

Applicant(s)

CHEN, ZEWU

Examiner

Therese Barber

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 December 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-48 is/are pending in the application.
- 4a) Of the above claim(s) 25-40 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-24 and 41-48 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 September 2000 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2,4. 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Claims 25-31 have been withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to an apparatus for diffracting x-rays, classified in class 378, subclass 70, with there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in Paper No. 6.
2. Newly submitted claims 41-48 are dependent on claim 1. In addition, the claim language can be found in the specification.
3. The applicants cancelled claims 32-40.

Information Disclosure Statement

4. The reference AH is not a pending U.K. patent application. According to the reference AH submitted by the applicant, the patent entitled "X-ray analysis apparatus", U.K. Patent Number G266040, was issued in the U.K. on 10/13/1993, International Classification G01N 23/207. The correct information regarding this reference should be noted on the information disclosure statement. Appropriate correction is required.

Drawings

5. The drawings are objected to because informalities listed on Form PTO 948 – Notice of Draftsperson's Review. A proposed drawing correction or corrected drawings are required in

reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Objections

6. Claims 3, 7, 19, 23, 41, and 44-48 are objected to because of the following informalities:

Regarding claims 3, 41, 44-48, the term “x-ray” should be inserted after the term “doubly-curved” and before the term “optics” for consistency in the claim language.

Regarding claims 7 and 23, the term “at at least one of” should be removed from the claim language. Appropriate correction is required.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –
(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1-8, 10, 14-16, 18-24, 41, 42, 44 are rejected under 35 U.S.C. 102(b) as being anticipated by Hornstra et al. (USPN 4,649,557).

9. Regarding claim 1, Hornstra discloses an x-ray apparatus comprised of an x-ray source for providing x-rays (col. 3, line 59); a doubly-curved x-ray optic for diffracting the x-rays (col. 3, lines 1-11 and col. 4, lines 43-44); a surface which some of the diffracted x-rays are directed (col. 3, lines 59-60); and an x-ray detector (col. 3, lines 63-65). “A total reflection x-ray

fluorescence apparatus” is merely “a label” and there is no claimed structure set forth to distinguish the claim over Hornstra.

10. Regarding claims 2-8 and 10, Hornstra discloses all of the limitations as set forth in claim

1. In addition, Hornstra further disclose an apparatus wherein the doubly-curved x-ray optic focuses the x-rays onto the surface (col. 1, lines 57-60 and col. 2, lines 37-40); the doubly-curved x-ray optic is a crystal or multi-layer optic (col. 3, line 3); the doubly-curved x-ray optic has one or more atomic planes (col. 3, lines 4-6); the atomic planes are curved to form a toroidal, ellipsoidal, spherical, parabolic or hyperbolic shape (col. 2, lines 64-66); one or more apertures for limiting a convergent angle of the diffracted x-rays (col. 3, lined 66-68 and col. 4, lines 1-3); one or more apertures are positioned before the x-ray optic and after the x-ray optic (fig. 1); one or more apertures comprise an elongated slot (col. 4, lines 7-14); and the doubly curved x-ray optic employs Bragg’s law for diffraction of the x-rays (col. 2, lines 50-51).

11. Regarding claims 14-17, Hornstra discloses all of the limitations as set forth in claim 1.

In addition, Hornstra further disclose an apparatus wherein the doubly-curved x-ray optic has an optic surface of radius $2R$ and one more atomic parallel with the optic surface (col. 3, lines 36-39 and 43-45); wherein the doubly curved x-ray optic provides one of symmetric or asymmetric Bragg diffraction (col. 3, lines 66-68); and wherein the atomic planes are curved to form a toroidal, ellipsoidal, spherical, parabolic or hyperbolic shape (col. 2, lines 64-66). Toroidal means relating to a shape similar to a torus or toroid: doughnut-shaped. Therefore, the reference meets the broad interpretation of having atomic planes that can be circular.

12. Regarding claims 18-23, Hornstra discloses methodology for an x-ray apparatus

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comprised of an x-ray source for providing x-rays (col. 3, line 59); a doubly-curved x-ray optic for diffracting the x-rays (col. 3, lines 1-11 and col. 4, lines 43-44); a surface which some of the diffracted x-rays are directed (col. 3, lines 59-60); an x-ray detector (col. 3, lines 63-65) that can be utilized for fluorescent analysis (col. 4, lines 20-23); wherein the doubly-curved x-ray optic focuses some of the diffracted x-rays onto the surface (col. 1, lines 57-60 and col. 2, lines 37-40); wherein the x-rays are reflected from the surface with little or no x-ray scatter (col. 2, lines 37-40); one or more apertures for limiting a convergent angle of the diffracted x-rays (col. 3, lines 66-68 and col. 4, lines 1-3); and one or more apertures are positioned before the x-ray optic and after the x-ray optic (fig. 1).

13. Regarding claims 41, 42 and 44-46, Hornstra discloses all of the limitations as set forth in claim 1. In addition, Hornstra further discloses an apparatus wherein the doubly-curved x-ray optic has an optic surface of radius $2R$, a plurality of atomic planes of radius R_p which intersect the surface at angle α , the radius of the atomic planes of the doubly-curved x-ray optic are defined by an equation (col. 3, lines 36-39 and 43-45); wherein the angle α is greater than 0° and less than 90° (fig. 1); wherein the atomic planes are curved to form a toroidal, ellipsoidal, spherical, parabolic or hyperbolic shape (col. 2, lines 64-66); wherein doubly-curved x-ray optic exhibits asymmetric Bragg diffraction (col. 4, lines 3-6); and wherein the doubly-curved x-ray optic focuses the x-rays onto the surface (col. 1, lines 57-60 and col. 2, lines 37-40).

Claim Rejections - 35 USC § 103

14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

15. Claims 11-13, 24, 43, and 46-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hornstra as applied to claims 1, 18 and 41, respectively, and further in view of Tiffin et al. (USPN 5,742,658).

16. Regarding claims 11-13 and 24, Hornstra fails to disclose that the x-ray apparatus contains an analyzer; wherein the surface of the apparatus is optical reflection surface; and wherein the surface is a semiconductor wafer.

However, Hornstra discloses all of the limitations as set forth in claims 1 and 18, respectively.

Tiffin discloses an x-ray apparatus wherein a multilayer monochromator (col. 4, lines 32-35) is utilized to direct a beam of x-rays onto the surface of a semiconductor wafer (col. 4, lines 35-36; 98) to determine the elemental compositions and locations of particles. In addition, Tiffin discloses an analyzer (96) for determining the elemental compositions and locations of particles on the surfaces of the semiconductor wafer (col. 15, lines 55-67 and col. 16, lines 1-20 and lines 42-57).

It would have been obvious to one having ordinary skill in the art at the time the invention was made that the doubly-curved x-ray optic as disclosed by Hornstra could be substituted for the monochromator of the x-ray apparatus of Tiffin which directs x-rays onto the surface of a semiconductor wafer. Accordingly, the motivation is to reduce the cost of manufacturing semiconductor wafers by testing a number of wafers to determine if any particles are located on the surfaces of the semiconductor wafers.

17. Regarding claims 43 and 46-47, Hornstra fails to disclose that the angle α is greater than 0° and less than 20° . Furthermore, Hornstra fails to disclose that the doubly-curved x-ray optic of the disclosed apparatus can focus x-rays to a footprint that is less than 1mm or less than 500 microns on the surface.

However, Hornstra discloses all of the limitations as set forth in claims 1 and 41, respectively.

Tiffin discloses an x-ray apparatus wherein a multilayer monochromator (col. 4, lines 32-35) is utilized to direct a beam of x-rays onto the surface of a semiconductor wafer (col. 4, lines 35-36; 98) to determine the elemental compositions and locations of particles and wherein the disclosed x-ray apparatus has an angle of incidence, formed between the beam of x-rays and the surface, is less than 0.2 degrees (col. 18, lines 61-67). Tiffin, also, discloses that the reduced angle of incidence results in reduced background intensity levels, thereby, increasing the sensitivities of the apparatus (col. 3, lines 26-30). In addition, it is well known in the art that technique disclosed by Tiffin is very sensitive to very dilute quantities of material (a few parts in 10^9), and require very flat surfaces.

It would have been obvious to one having ordinary skill in the art at the time the invention was made that the doubly-curved x-ray optic as disclosed by Hornstra could be substituted for the monochromator of the x-ray apparatus of Tiffin which directs x-rays onto the surface and has a reduced angle of incidence of less than 20° . Accordingly, the motivation is to reduce the background noise, thereby, increase the sensitivities of the x-ray apparatus for the detection of particles on the surface.

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Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Therese Barber whose telephone number is (703) 306-0205. The examiner can normally be reached on Monday to Friday from 8:30 a.m. to 6:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Kim can be reached on (703) 305-3492. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 746-4857 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-4900.

tb 
April 5, 2002


David P. Porta
Primary Examiner